

REMARKS/ARGUMENTS

Examiner Shrinivas H. Rao is thanked for thoroughly reviewing the instant application and for examining the Prior Art.

Claims 1-24 and claim 28 have been cancelled, claims 25-27 are currently pending in the Application.

Favorable reconsideration of this application in light of the above amendments and the following remarks is respectfully requested.

Claim rejections - 35 U.S.C. § 112

Reconsideration of the rejection of claims 25-28 under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for "intersects with said network of trenches under an angle of 90 degrees" (specification pages 8 and 15), does not reasonably provide enablement for intersects with said first network of trenches under angles other than 90 degrees, is respectfully requested based on the following.

Independent claim 25 of the claimed invention has been amended to read: "said second network being in contact with and intersecting with said first network", thereby removing specification of a specific angle under which the second network (of trenches) intersects with the first network (of trenches), removing Examiner's objection to claim 25.

In light of the foregoing response, applicant respectfully requests that the Examiner's rejection of claims 25-28 under 35 U.S.C 112, first paragraph, be withdrawn.

Claim rejections - 35 U.S.C. § 112

Reconsideration of the rejection of claims 25-28 under 35 U.S.C 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention is respectfully requested based on the following.

The Examiner is thanked for pointing out the various problems in the claims. The claims 25-28 have been

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carefully reviewed and amended to correct those problems the Examiner pointed out, in addition to others. All claims are now believed to be in allowable condition.

Specifically, the objected to claim 27 has been amended to read, instead of (claim 27): "said second layer of dielectric trenches is extended in thickness", (claim 27) reads: "said second layer of dielectric having a thickness between about 1000 and 4000 Angstroms".

No new matter has been introduced by this latter amendment to claim 27.

In light of the foregoing response, applicant respectfully requests that the Examiner's rejection of claims 25-28 under 35 U.S.C 112, second paragraph, be withdrawn.

Claim rejections - 35 U.S.C. § 102

Reconsideration of the rejection of claims 25-28 under 35 U.S.C 102(b), as being anticipated by Katoh (US Patent

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5,141,896) is respectfully requested based on the following.

"Similar", a term used by Examiner to equate the instant claimed invention with the Katoh invention, has the meaning of "like, resembling exactly corresponding in shape, without regard to size".

Applicants, have, by way of this response, amended independent claim 25 to more clearly recite the invention. No new matter is added by way of this amendment which is support by Figures 7 -8 and paragraphs [0040]-[0046] and in particular paragraph [0046] of the description.

Referring to Figure 8(a), claim 25 as amended clarifies that the interconnect structure created by the instant invention comprises a semiconductor surface having created thereover a low k compound layer of inter metal dielectric (14, 18 and 30) which separates the first level metal 12 from second layer metal 28.

In particular, the compound layer of inter metal dielectric in the present invention comprises a first layer

of dielectric 14 comprising a first network of trenches 16 filled with air and a second layer of dielectric 18 comprising a second network of trenches 16 filled with air. The second layer of dielectric 18 is in contact with the first layer of dielectric 14. Additionally, the second network of trenches in the second layer of dielectric is also in contact with and intersects with the first network trenches in the first layer to form an interconnected network of trenches filled with air.

Katoh, by contrast, has its first 2 and second-level 6 interconnections separated by a single layer "crossing point" 3 of inorganic insulating film (see Figure 1 of Katoh). Therefore, the present invention provides a structure of an air gap formation in a layer of inter metal dielectric that is mechanically stable (see paragraph [0017] of the description)

Additionally, amended claim 25 also includes a limitation not disclosed in Katoh of

"(3) a layer of oxide 22/26 deposited over said second layer of dielectric, said layer of oxide comprising:

(i) a first layer of oxide 22 having openings 24 created there-through, said openings being aligned with the intersections between said first and second network of trenches, enabling creation of said first and second network of trenches; and

(ii) a second layer of oxide 26, said second layer of oxide closing the openings in the first layer of oxide."

Applicant kindly suggests, based on the above presented arguments, that claim 25, and dependent claims 26-27, are unique and therefore patentable over the Katoh.

Some of the more salient differences between the instant claimed invention and Katoh are summarized following:

- Katoh provides for crossing points for interconnections of semiconductor devices, the instant invention provides air gaps between metal lines
- Fig. 1 of Katoh shows a first level interconnect (level 1) over which a second level (level 6) of interconnect is created; the instant invention, provides for trenches in overlying layers of dielectric, the trenches being filled with air

- the metal interconnects of the instant invention are separated by a compound layer of dielectric, due to the special process of the invention the trenches are filled with air, and
- the conductive layers of interconnects of the instant invention are separated by (multiple) layers of dielectric in order to create a dielectric of low dielectric constant; by contrast, the conductive layers of the Katoh invention are overlying and perpendicularly intersecting and are separated by an insulating film for the obvious reason that the overlying conductive layers would otherwise form electrical shorts there-between.

Katoh does not provide for overlying and intersecting trenches. Katoh provides for overlying, intersecting layers of metal, which are (by necessity) separated by a layer of insulation. Katoh does not provide for a first and a second layer of oxide, the first to enable creating holes there-through, the second to close the created air space.

Neither the trenches as used by the instant invention nor the air spaces inside a layer of dielectric that separates interconnect traces, nor the first created openings (removing material contained in the trenches) and the

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closing of these openings overlying the trenches is provided by Katoh, nor is any reference thereto provided by Katoh.

In light of the foregoing response, applicant respectfully requests that the Examiner's rejection of claims 25-28 under 35 U.S.C 102(b), as being anticipated by Katoh (US Patent 5,141,896), be withdrawn.

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Other Considerations

No new independent or dependent claims have been written as a result of this office action, no new charges are therefore incurred due to this office action.

It is requested that should Examiner not find the claims to be allowable that he call the undersigned Attorney at his convenience at 845-452-5863 to overcome any problems preventing allowance.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'S. Ackerman', with a long horizontal flourish extending to the right.

Stephen B. Ackerman (Reg. No 37,761)